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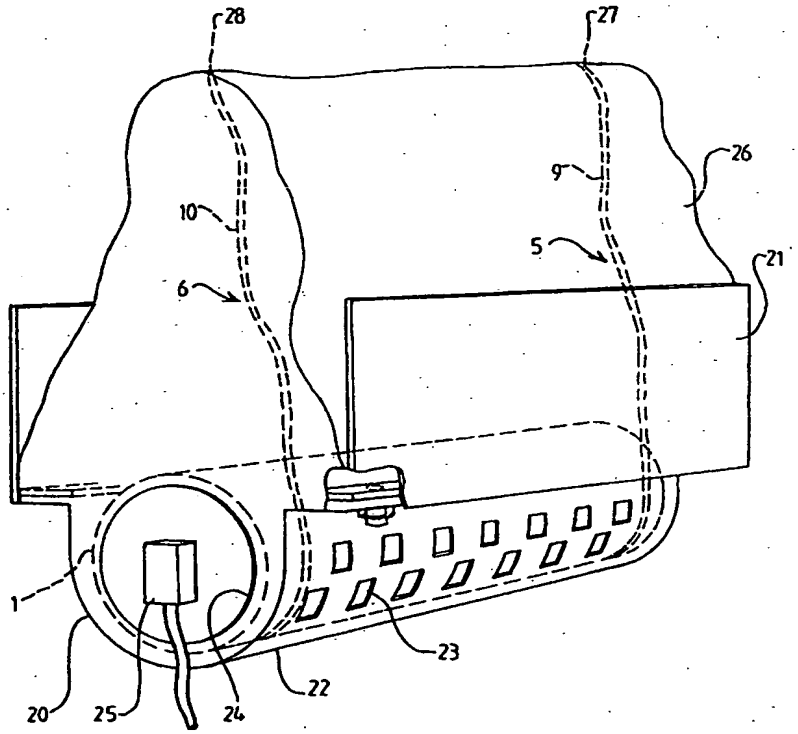
(54) Title: AN AIR–BAG ARRANGEMENT

(57) Abstract

An air–bag arrangement comprising an air–bag (26), a gas generator (24) and a housing (20). The air–bag is initially in a folded condition and is located adjacent the gas generator. The folded air–bag is stored within the housing. The interior of the air–bag is in gas flow communication (3) with the gas generator. The gas generator incorporates a valve (2) constitued by a rotatable cylindrical diffuser which surrounds the gas generator (24). The valve presents an aperture (4) which in an initial position of the valve permits gas from the gas generator to flow through a flow passage (23) to the exterior of the housing. On partial inflation of the air–bag tension is applied to a strap (6) which has one end (7) secured to the tube (2) and the other end (10) secured to part of the air–bag. On rotation of the tube (2) as a consequence of the force applied to it by the strap (6) during inflation of the air–bag, the tube (2) is rotated thus closing, or at least partlyclosing, the flow passage (23) to the exterior of the housing.



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"AN AIR-BAG ARRANGEMENT"

THE PRESENT INVENTION relates to an air-bag arrangement, and more particularly relates to an air-bag arrangement adapted for use in a motor vehicle.

It has been proposed to provide an air-bag which is initially mounted, in a folded condition, in front of a driver or front seat occupant of the vehicle, the air-bag being inflated, by a gas generator, in the event that a frontal impact or severe deceleration of the vehicle is sensed. When an air-bag of this type is inflated, initially a substantial quantity of gas is injected into a very tightly folded air-bag. The available space within the tightly folded air-bag to receive the gas that is injected into the air-bag is very small, and as a consequence, a very substantial velocity is imparted to various regions of the fabric that form the air-bag. As the air-bag inflates these regions of fabric move, with a substantial velocity, generally towards the driver or occupant of the vehicle. If the driver or occupant of the vehicle is not in the anticipated position, in which the driver or occupant of the vehicle is sitting back fully in the seat, part of the fabric of the air-bag may impact with the driver or occupant of the vehicle with substantial force, injuring the driver or occupant of the vehicle. Even if the driver or occupant of the vehicle is in the correct position, there is still a risk

that the rapidly moving part of the fabric of the air-bag will impact with the driver or occupant of the driver.

EP-A-0,599,377 discloses a motor vehicle provided with an air-bag arrangement mounted on the steering column to provide protection for the driver of the vehicle.

A vent is provided which constituted by an area formed in the side wall of the air-bag which has a plurality of apertures. The vent is initially opened, but incorporates a valve flap which can move to a position in which the valve flap is aligned with some of the openings, so that the aggregate size of the vent openings is partially reduced. The flap is moved to this position by a tether which is secured to the flap, and which is also secured to part of the air-bag which moves towards the occupant of the vehicle. While the air-bag is in the initial stages of inflation, the vent is open. Thus, should the driver impact with the air-bag whilst the air-bag is only partially inflated, gas may escape through the vent which is fully open. However, as the air-bag becomes fully inflated, the vent is partially closed, and should the driver then impact with the air-bag, gas may only escape from the air-bag through the partially closed vent. The air-bag described in this prior art document suffers from the disadvantage that although the vent is initially open, the vent is formed from part of the fabric that is folded, and consequently during the initial stages of inflation of the bag, no gas may escape through the vent. Thus, as the air-bag inflates, regions of fabric will move with a substantial velocity, as described above.

The present invention seeks to provide an improved air-bag arrangement.

According to this invention there is provided an air-bag arrangement, the air-bag arrangement comprising an air-bag, gas generator and a housing, the

air-bag initially being in a folded condition and being located adjacent the gas generator, and being stored within the housing, with the interior of the air-bag being in gas-flow communication with the gas generator, there being an initially open valve incorporating an aperture passing through the housing to the space outside the housing to permit gas to flow from the gas generator to the space outside the housing during an initial phase of the inflation of the bag, means being provided to close or partially close the valve in response to a predetermined movement of the front part of the bag during inflation of the bag.

Preferably the valve is controlled by an elongate flexible element, one end of which is connected to the front part of the air-bag.

Conveniently the elongate flexible element is connected to a component of the valve, and is adapted to move the said component of the valve from a position in which the passage through the housing to the space outside the housing is substantially open to a position in which that passage is substantially or completely closed.

In one embodiment the said element comprises a shutter.

Alternatively the said element comprises a diffuser associated with the gas generator, the diffuser having a first apertured region defining a flow passage, the first apertured region of the diffuser initially being aligned with the said aperture provided in the housing, the diffuser being movable to a position in which the first apertured region is not aligned with the said aperture in the housing.

Preferably the diffuser is provided with a further apertured region defining a further flow passage, the further region initially being located to

permit a flow of gas from the gas generator to the interior of the air-bag during an initial stage in the inflation of the air-bag, the said first apertured region being adapted to be moved to a position in which gas from the gas generator will flow through the said first region to complete inflation of the air-bag, the flow passage defined by the said first apertured region being of a greater cross-sectional area than the further flow passage defined by the further apertured region.

Conveniently the gas generator is of cylindrical form and the gas diffuser comprises a tube, the gas generator being received within the tube.

Advantageously the diffuser is provided with a plurality of apertures in the said first region defining the flow passage, and is also provided with a further plurality of apertures in the said further region defining the further flow passage, the apertures in each region extending axially of the tube.

In a further embodiment the elongate flexible element comprise a pair of straps, each strap having one end secured to the tube, and another end secured to part of the air-bag, each strap being partly wound around the exterior of the tube.

Conveniently the valve comprises a shutter associated with the aperture formed in the housing, motor means being provided to drive the shutter between an initial opened position and a subsequent closed or substantially closed position, a controller being provided to control the motor means, means being provided responsive to movement of the front part of the air-bag to provide a signal to the controller.

Preferably the means to respond to movement of the front part of the air-bag comprise means adapted to measure movement of an elongate element, one end of which is connected to the front part of the air-bag.

Conveniently the controller is associated with one or more sensors adapted to provide signals to the controller. The sensor may comprise a temperature sensor, or may comprise a weight sensor adapted to sense the weight of the person to be protected by the air-bag, or may comprise a sensor comprising a position sensor adapted to sense the position of a person to be protected by the air-bag, although sensors of all three types may be provided.

In order that the invention may be more readily understood, and so that further features thereof may be appreciated, the invention will now be described, by way of example, with reference to the accompanying drawings in which:

FIGURE 1 is a diagrammatic view of a diffuser for a cylindrical gas generator, the diffuser comprising an important component of an air-bag arrangement in accordance with the invention,

FIGURE 2 is a diagrammatic view of an air-bag arrangement incorporating a cylindrical gas generator and a gas diffuser of the type shown in Figure 1,

FIGURE 3 is a sectional view of the arrangement shown in Figure 2,

FIGURE 4 is a view similar to Figure 2 illustrating an alternative embodiment of the invention,

FIGURE 5 is a diagrammatic view illustrating an air-bag in accordance with the invention during a preliminary stage of inflation,

FIGURE 6 is a view illustrating the bag of Figure 5 in a full state of inflation,

FIGURE 7 is a view of the bag of Figure 5 in a condition that it will occupy in the event that the driver or occupant of the vehicle to be protected by the bag is initially out of position,

FIGURE 8 is a sectional view of another embodiment of the invention, and

FIGURE 9 is a sectional view of a further embodiment of the invention.

Referring initially to Figure 1 of the accompanying drawings, a gas diffuser 1 is illustrated, the diffuser forming an important component of the air-bag arrangement that will be described hereinafter. The gas diffuser 1 comprises a hollow cylinder or tube 2. The cylinder or tube 2 is dimensioned to receive a cylindrical gas generator within the interior of the tube.

The tube is provided, in a first region, with a first set of apertures 3, the apertures comprising a single row of apertures extending axially of the tube at a predetermined position, the apertures extending in a line parallel with the axis of the tube. The total cross-sectional area of the apertures 3 is relatively small. The apertures 3 define a first flow passage for gas from the gas generator.

The tube is provided, in a second region, with a second set of apertures 4. The apertures 4 comprise a greater number of apertures than the

apertures 3, and also define apertures having a greater cross-sectional area. The apertures 4 define a second flow passage for gas from the gas generator. In the embodiment illustrated, two staggered rows of apertures 4 are provided, but any appropriate number and configuration of apertures 4 may be present in the tube, provided that the apertures 4 present a larger cross-sectional area than the combined cross-sectional areas of the apertures 3.

Two elongate flexible elements in the form of straps 5,6 are provided which have their ends 7,8 secured to the exterior of the tube and which have their free ends 9,10 wound around the tube in the same direction. It is to be appreciated that by providing an upwardly pull on the free ends 9,10 of the straps, as indicated by the arrows 11,12, the tube 2 will be caused to rotate in an anti-clockwise direction as seen in Figure 1.

As will become clear from the following description, the diffuser 1 constituted by the tube 2 surrounds a cylindrical gas generator and is initially in such a position that gas from the gas generator, when the gas generator is actuated in response to an accident, or potential accident being sensed, passes through the apertures 3 into the interior of the gas bag, as indicated by the arrows 13, and also pass through the apertures 4 to the atmosphere. Because the cross-sectional area of the apertures 3 is relatively small, the gas will cause a relatively gentle initial inflation of the air-bag, and because the apertures 4 vent gas from the gas generator to the atmosphere, the gas pressure within the air-bag is not excessive. Subsequently, when an upward pull is provided to the free ends 9,10 of the straps 5,6 in the direction of the arrows 11,12, the tube 2 rotates. When the tube has rotated the apertures 4 are no longer in a position to permit the venting of gas from the interior of the air-bag. Instead the apertures 4 are located to direct a gas flow into the interior of the air-bag. Because the cross-sectional area of the apertures 4 is relatively large, a

substantial flow of gas then enters the interior of the air-bag through the apertures 4, so that the air-bag rapidly becomes fully inflated. The diffuser thus acts as a valve which is open to permit gas to be vented from the bag during an initial stage of inflation, but which is subsequently closed.

Referring now to Figure 2 of the accompanying drawings, a modified air-bag arrangement is illustrated. Where parts of the arrangement correspond with those of Figure 1, the same reference numerals will be used and the parts will not be re-described. The air-bag arrangement comprises a housing 20. The housing 20 comprises a generally rectangular portion 21 which initially accommodates a folded air-bag, this portion having a semi-cylindrical downwardly extending projection 22, which extends downwardly from the base of the rectangular portion 4. A plurality of apertures 23 are formed in one side of the wall of the downwardly extending projection 22.

Contained within the downwardly extending projection 22 is a substantially cylindrical gas generator 24, and a squib 25 provided on the exterior of the housing communicates with the gas generator 24 to initiate the gas generator in the event that an accident should occur. The gas generator 24 is surrounded by the gas diffuser 1, as constituted by the tube 2, as described above. Secured to the base of the rectangular portion 21 of the housing 20 is the open mouth of an air-bag 26. The free ends 9,10 of the straps 5,6 are connected to a part of the fabric forming the air-bag at regions 27,28 which are regions forming the front part of the air-bag which, when the air-bag is fully inflated, will be located immediately adjacent the driver or occupant of the vehicle to be protected by the air-bag.

Referring now to Figure 3, which is a cross-sectional view of the arrangement shown in Figure 2, it can be seen that the cylindrical gas

generator 24 is substantially surrounded by the tube 2 forming the diffuser 1, although there is a small space provided between the outer periphery of the gas generator 24 and the interior of the tube 2 to facilitate the flow of gas.

The apertures 4 formed in the tube 2 are substantially aligned with the apertures 23 formed in the downwardly extending projection 22 located beneath the rectangular part 21 of the housing 20. It is equally to be appreciated that the apertures 3 provided in the diffuser 1 communicate directly with the interior of the bag 26. The bag 26 is folded so that the bag is accommodated within the rectangular portion 21 of the housing 20.

In the event that the gas generator is activated, gas will flow, from the gas generator 24 into the space between the gas generator and the tube 2. Some gas will flow through the apertures 3, as indicated by the arrows 13 in Figure 1 into the interior of the air-bag 26, thus initiating inflation of the air-bag. However, the cross-section of the apertures 3 is not very great, and consequently the air-bag is only inflated in a gentle manner. Thus, whilst an acceleration is imparted to the fabric of the air-bag, the acceleration is not very high.

During this stage of the inflation of the air-bag, gas from the gas generator also flows through the apertures 4 formed in the tube 2 of the diffuser 1 and through the co-aligned apertures 23 formed in the projection 22 that forms part of the housing 20. This flow is indicated by the arrows 14 in Figure 1. Thus, there is no undesirable build-up of gas pressure within the air-bag.

As the air-bag inflates, so the front part of the air-bag, including the regions 27,28 where the free ends 9,10 of the straps 5,6 are secured to the

fabric of the air-bag, moves further and further away from the gas generator. Eventually the straps 5,6 become tightened, and on further movement of the front part of the air-bag, tension is applied to the straps and the diffuser 2 is rotated, relative to the gas generator, and as a consequence the apertures 4 are no longer aligned with the apertures 23 formed in the projection 22 that forms part of the housing 20, but instead are aligned with the interior of the air-bag 26. A portion of the tube 2 that forms the diffuser 1 that is not provided with any apertures is thus aligned with the apertures 23 formed in the projection 22 that forms part of the housing 20. Thus, the apertures 23 are substantially closed. However, in certain embodiments some continued slight venting of the bag through the apertures 23 may prove to be desirable, and thus the tube 2 may be provided with small apertures to be aligned with the apertures 23 after the tube has been rotated as described above.

It is to be appreciated that once the diffuser has been rotated as a consequence of the tension applied to the straps 5,6, a very substantial rate of flow of gas from the gas diffuser to the interior of the bag may be achieved, since the gas may flow through the apertures 4 directly into the interior of the partially inflated bag, and since the apertures 4 have a relatively large cross-sectional area, a substantial quantity of gas may pass through the apertures 4. Thus the air-bag rapidly becomes fully inflated.

It is to be appreciated, however, that if a person to be protected by the air-bag is not sitting in the anticipated position, but instead is leaning forwardly, part of the air-bag, most probably the front part of the air-bag, including the regions 27 and 28 where the straps 5,6 are secured to the fabric of the air-bag, will impact with part of the driver or other occupant of the vehicle, at a point before any tension has been applied to the straps 5,6. Consequently, during continuing inflation of the bag, no tension is applied to the straps 5,6,

which means that the diffuser is not rotated. It will thus be understood that whilst the air-bag continues to inflate, it will only inflate with gas passing through the apertures 3, which have a relatively small cross-sectional area, and thus the bag will only continue to inflate relatively slowly. Also, the vent to the atmosphere provided by the apertures 4 will remain open, thus preventing any undesirable high pressure within the bag. This is not disadvantageous because, of course, the occupant of the vehicle is already in contact with the air-bag, and thus there is no need for the air-bag to move further towards the driver or occupant of the vehicle.

Figure 4 illustrates a modified embodiment of the invention. In this embodiment of the invention the air-bag 26 is not secured to any part of the housing, but instead totally surrounds the gas generator, and the associated diffuser 2. The housing is of a modified design, but is still provided with the apertures 23 as described above. The diffuser also has the apertures 4 as described above, and the air-bag 26 is provided with a reinforced panel 30 which is provided with a plurality of apertures 31, these apertures 31 being co-aligned with the apertures 4 and the apertures 23.

The embodiment illustrated in Figure 4 will operate in basically the same way as the embodiment described with reference to Figures 2 and 3. At the commencement of inflation of the air-bag, gas from the gas generator will pass through the relatively small cross-section apertures 3 to commence inflation of the air-bag, and when tension is applied to the straps 5,6, at an advanced stage during the inflation of the air-bag, the tube 2 comprising the diffuser 1 will be rotated, thus bringing an unapertured portion of the tube into alignment with the apertures 31 formed in the air-bag, and the apertures 23 formed in the housing, thus stopping or reducing the venting of the air-bag, whilst also bringing the apertures 4, of relatively large cross-section, to a

position at which gas may flow through those apertures 4 to enable the inflation of the air-bag to be completed rapidly.

Figure 5 is a schematic view illustrating an air-bag in accordance with the invention during an initial stage of inflation whilst the occupant of the vehicle is in the anticipated position.

It can be seen that the relatively small cross-section apertures 3 are positioned to direct gas from the gas generator into the air-bag 26. Figure 6 shows the situation when the straps 5,6 become tight, and cause the tube 2 of the diffuser to rotate so that the apertures 4 direct a substantial stream of gas into the air-bag 26 to complete the inflation of the air-bag 26. The air-bag 26 is thus positioned to provide adequate protection for the occupant of the vehicle.

Figure 7 illustrates the situation that arises if the occupant of the vehicle is initially not in the anticipated position, but instead is forward of the anticipated position. As the air-bag 26 commences to inflate, the tube 2 of the diffuser 1 is positioned so that gas flows through the relatively small cross-section apertures 3 into the air-bag 26, and is simultaneously vented to the atmosphere through the apertures 4. The air-bag 26 impacts with the occupant of the vehicle before the straps 5 and 6 have become tight, and consequently the straps 5 and 6 never do become tight. Consequently the tube 2 does not rotate and thus completion of inflation of the air-bag is effected through the apertures 3, with continuing venting to the atmosphere through the apertures 4.

Referring now to Figure 8 of the accompanying drawings, in an alternative embodiment of the invention an air-bag 30 is provided which, as shown in Figure 8, is initially in a folded state, the open mouth of the air-bag being connected to outwardly directed lips 31,32 formed on a housing 33 which

contains a cylindrical gas generator 34. The gas generator 34 is provided with a plurality of openings 35 through which gas may be directed into the interior of the housing 33. Because the interior of the housing 33 is in communication with the interior of the air-bag 30, the gas will serve to inflate the air-bag.

An aperture 36 is provided in the wall of the housing 33, the aperture 36 being associated with a valve in the form of a slidable shutter 37. The slidable shutter 37 is connected to an elongate flexible element in the form of a wire or cable 38 which passes through an appropriate guide 39 so that tension applied to the wire or cable 38 moves the shutter 37 from a position in which the aperture 36 is open to a position in which the aperture 36 is closed or substantially closed.

The wire or cable 38 is connected to the front part of the air-bag 30 at point 40.

It is to be appreciated that in use of the embodiment illustrated in Figure 8, gas from the gas generator 34 initially passes through the apertures 35 into the interior of the air-bag 30. At this stage, the vent 36 is open, and consequently a substantial proportion of the gas injected into the interior of the air-bag escapes through the vent 36, meaning that the air-bag initially inflates gently. As the front part of the air-bag 40 moves towards the occupant of the vehicle and the air-bag becomes partially inflated, tension is applied to the wire or cable 38 moving the shutter 37 to a position in which the aperture 36 is closed, or substantially closed. Subsequently, virtually all of the gas from the gas generator 34 is retained within the interior of the air-bag 30 and consequently, the inflation of the air-bag 30 is completed rapidly. It will thus be appreciated that the air-bag illustrated with reference to Figure 8 operates in

a very similar way to the air-bags described above with reference to Figures 1 to 7.

Figure 9 illustrates a modified embodiment of the invention which, in many respects, is similar to the embodiment illustrated in Figure 8. In this embodiment an air-bag 50 is provided, which is initially in a folded state, the open mouth of the air-bag 50 being connected to outwardly directed lips 51,52 formed in a housing 53 which contains a cylindrical gas generator 54 provided with gas outlet openings 55. An aperture 56 is formed in the housing 53 which is associated with a valve in the form of a moveable shutter 57. The shutter 57 is associated with an electric drive motor 58 which is adapted to drive the shutter from an initial position, as illustrated, in which the aperture 56 is substantially open, to an alternate position in which the aperture 56 is closed or partially closed.

An elongate flexible element in the form of a wire or cable 59 is provided, one end of which is connected, at point 60, to the front part of the air-bag 50. The wire or cable 59 passes to the exterior of the housing past a measuring wheel 61 which is adapted to measure the length of wire passing the measuring wheel. Thus the measuring wheel may be provided with a peripheral groove adapted to grip the wire in a nip between the periphery of the measuring wheel and a fixed surface.

The measuring wheel is connected to supply a signal to control circuit 62. The control circuit 62 also receives signals from various sensors. A first sensor is a temperature sensor 63 adapted to sense ambient temperature. The second sensor is a weight sensor 64 adapted to sense the weight of the occupant of a vehicle seat to be protected by the air-bag 50. The third sensor 65 is a position sensor, which is a sensor adapted to sense the general position of the

occupant of the seat. The position sensor may, therefore, comprise an arrangement to measure the distance between the dashboard (or steering wheel) of the vehicle and the occupant to be protected by the air-bag, or may comprise a plurality of load cells connected to the seat of the vehicle arranged to determine the position of the centre of gravity of the occupant of the vehicle relative to the seat.

On inflation of the air-bag, the wire or cable 59 will be drawn past the measuring wheel 61 as the air-bag inflates and as the front part 60 of the air-bag moves towards the occupant of the vehicle to be protected by the air-bag. The controller will respond to signals from the measuring wheel to move the shutter 57 to close the aperture 56, or partially close the aperture, at an appropriate moment. The appropriate moment for closing the aperture, and the degree of closing (fully closed or partially closed) determined in dependence upon the parameters sensed by the sensors. Thus, if the occupant of the vehicle to be protected by the air-bag is relatively heavy, the aperture 56 could be closed sooner than if the occupant is very light. If the occupant is sitting forwardly in his seat (i.e. is in the "out of position" position), then the aperture 56 could even be maintained in an open condition.

It is thus to be appreciated that the embodiment of Figure 9 will again operate generally in the manner described above, with the valve constituted by the shaft 57 and the aperture 56 being controlled at least partially in response to movement of the front part of the air-bag towards the occupant of the vehicle.

In the present specification the word "comprise" or "comprises" means "includes or consists of" and "comprising" means "including or consisting of".

CLAIMS:

1. An air-bag arrangement, the air-bag arrangement comprising an air-bag, a gas generator and a housing, the air-bag initially being in a folded condition and being located adjacent the gas generator, and being stored within the housing, with the interior of the air-bag being in gas-flow communication with the gas generator, there being an initially open valve incorporating an aperture passing through the housing to the space outside the housing to permit gas to flow from the gas generator to the space outside the housing during an initial phase of the inflation of the bag, means being provided to close or partially close the valve in response to a predetermined movement of the front part of the bag during inflation of the bag.

2. An air-bag arrangement according to Claim 1 wherein the valve is controlled by an elongate flexible element, one end of which is connected to the front part of the air-bag.

3. An air-bag arrangement according to Claim 2 wherein the elongate flexible element is connected to a component of the valve, and is adapted to move the said component of the valve from a position in which the passage through the housing to the space outside the housing is substantially open to a position in which that passage is substantially or completely closed.

4. An air-bag arrangement according to Claim 3 wherein the said element comprises a shutter.

5. An air-bag arrangement according to Claim 3 wherein the said element comprises a diffuser associated with the gas generator, the diffuser having a first apertured region, defining a flow passage, the first apertured region of the diffuser initially being aligned with the said aperture provided in the housing, the diffuser being movable to a position in which the first apertured region is not aligned with the said aperture in the housing.

6. An air-bag arrangement according to Claim 5 wherein the diffuser is provided with a further apertured region defining a further flow passage, the further region initially being located to permit a flow of gas from the gas generator to the interior of the air-bag during an initial stage in the inflation of the air-bag, the said first apertured region being adapted to be moved to a position in which gas from the gas generator will flow through the said first region to complete inflation of the air-bag, the flow passage defined by the said first apertured region being of a greater cross-sectional area than the further flow passage defined by the further apertured region.

7. An arrangement according to Claim 5 or 6 wherein the gas generator is of cylindrical form and the gas diffuser comprises a tube, the gas generator being received within the tube.

8. An arrangement according to Claim 7 wherein the diffuser is provided with a plurality of apertures in the said first region defining the flow passage, and is also provided with a further plurality of apertures in the said further region defining the further flow passage, the apertures in each region extending axially of the tube.

9. An arrangement according to Claim 7 or 8 wherein the elongate flexible element comprise a pair of straps, each strap having one end secured to the

tube, and another end secured to part of the air-bag, each strap being partly wound around the exterior of the tube.

10. An arrangement according to Claim 3 wherein the valve comprises a shutter associated with the aperture formed in the housing, motor means being provided to drive the shutter between an initial opened position and a subsequent closed or substantially closed position, a controller being provided to control the motor means, means being provided responsive to movement of the front part of the air-bag to provide a signal to the controller.

11. An arrangement according to Claim 10 wherein the means to respond to movement of the front part of the air-bag comprise means adapted to measure movement of an elongate element, one end of which is connected to the front part of the air-bag.

12. An arrangement according to Claim 10 or 11 wherein the controller is associated with one or more sensors adapted to provide signals to the controller.

13. An arrangement according to Claim 12 wherein a sensor comprises a temperature sensor.

14. An arrangement according to Claim 12 or 13 wherein a sensor comprises a weight sensor adapted to sense the weight of the person to be protected by the air-bag.

15. An arrangement according to any one of Claims 12 to 14 wherein a sensor comprises a position sensor adapted to sense the position of a person to be protected by the air-bag.

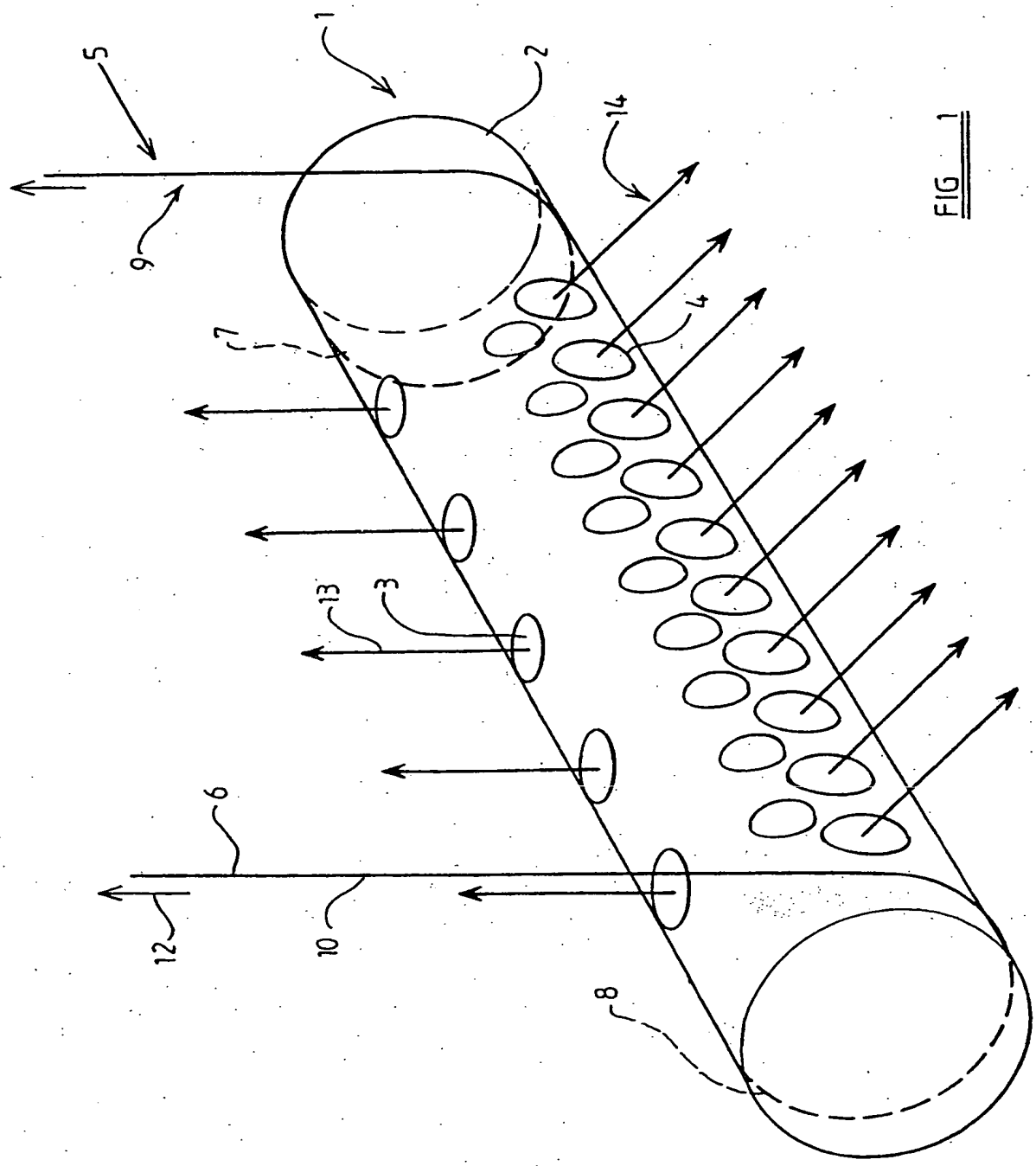

FIG 1

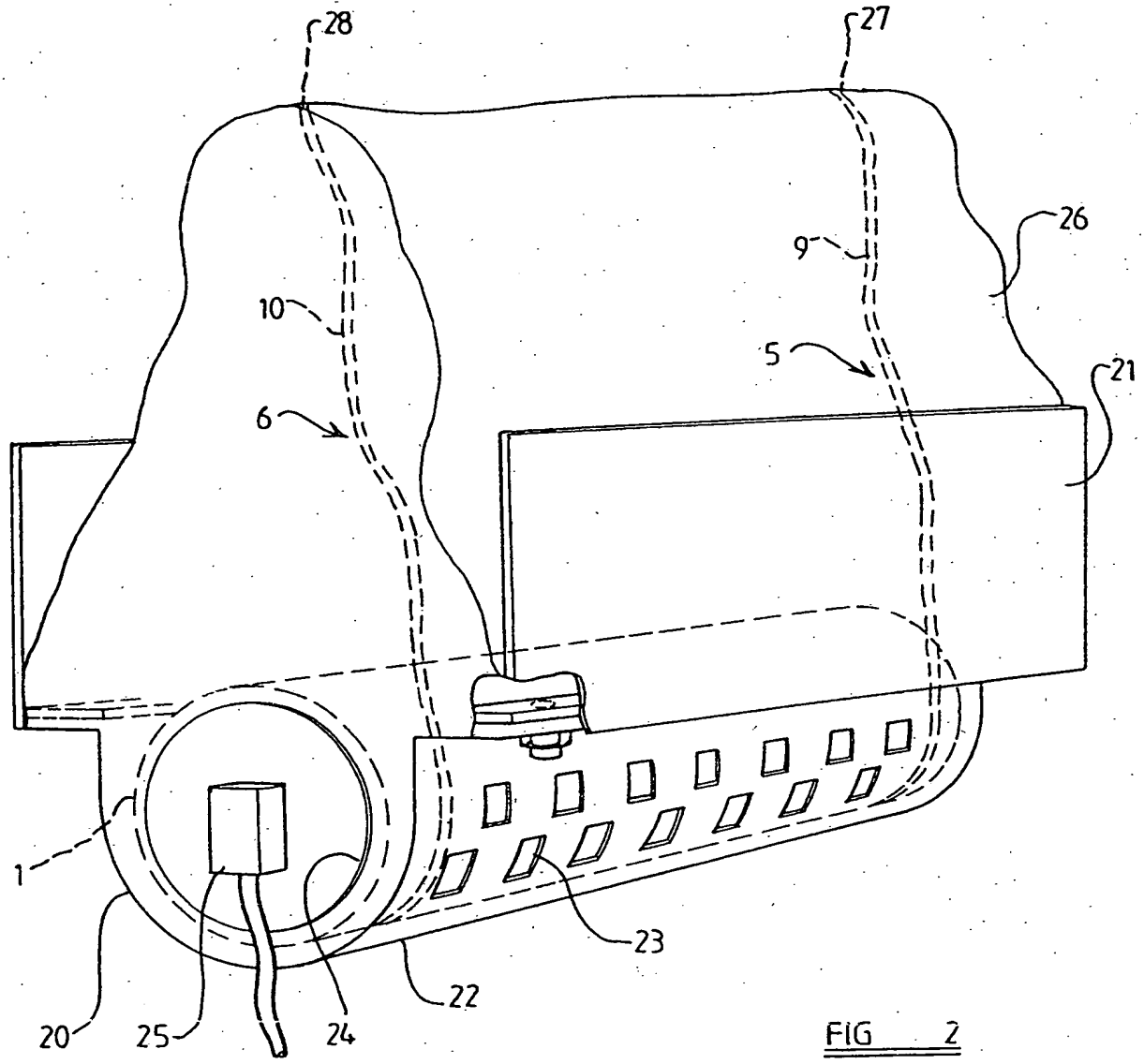

FIG 2

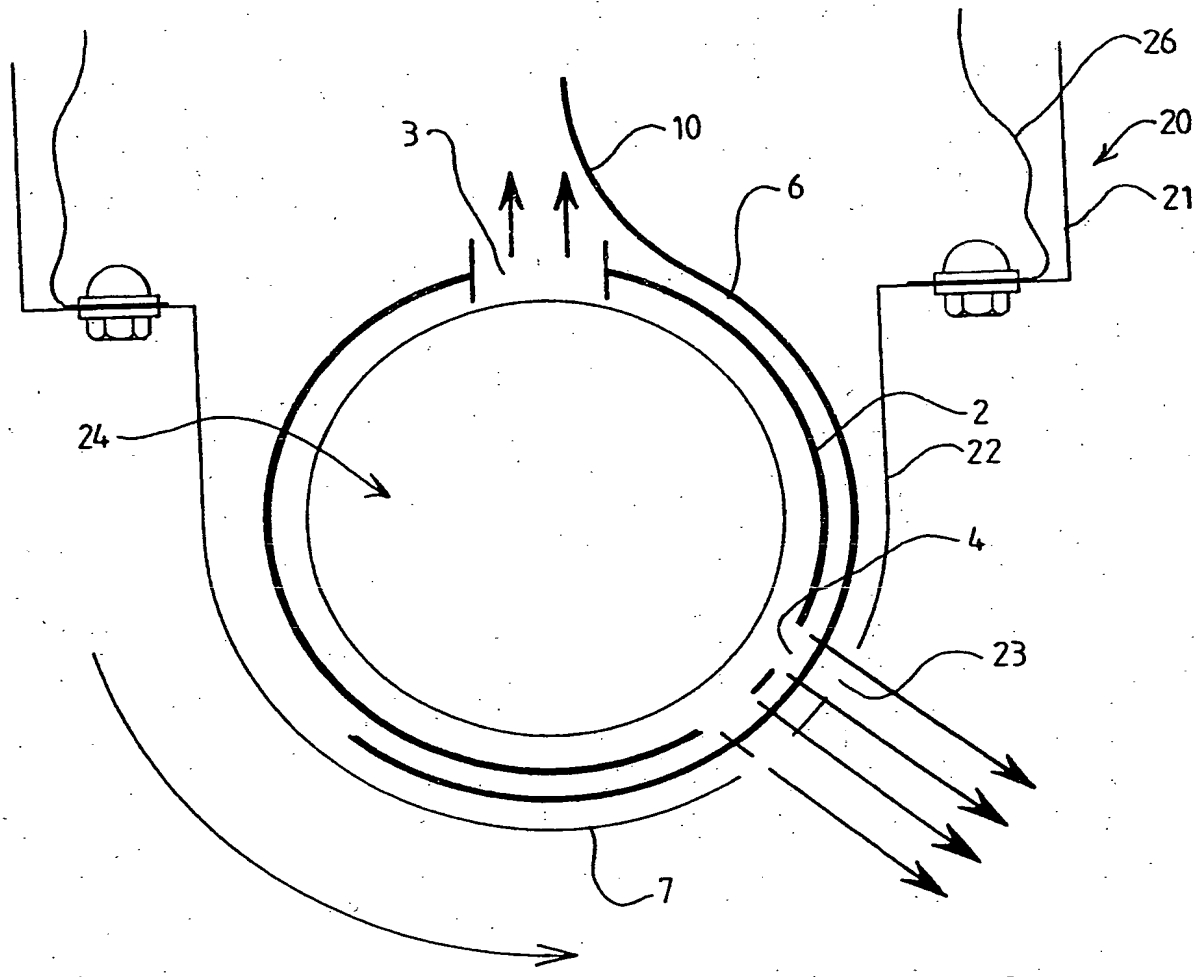

FIG 3

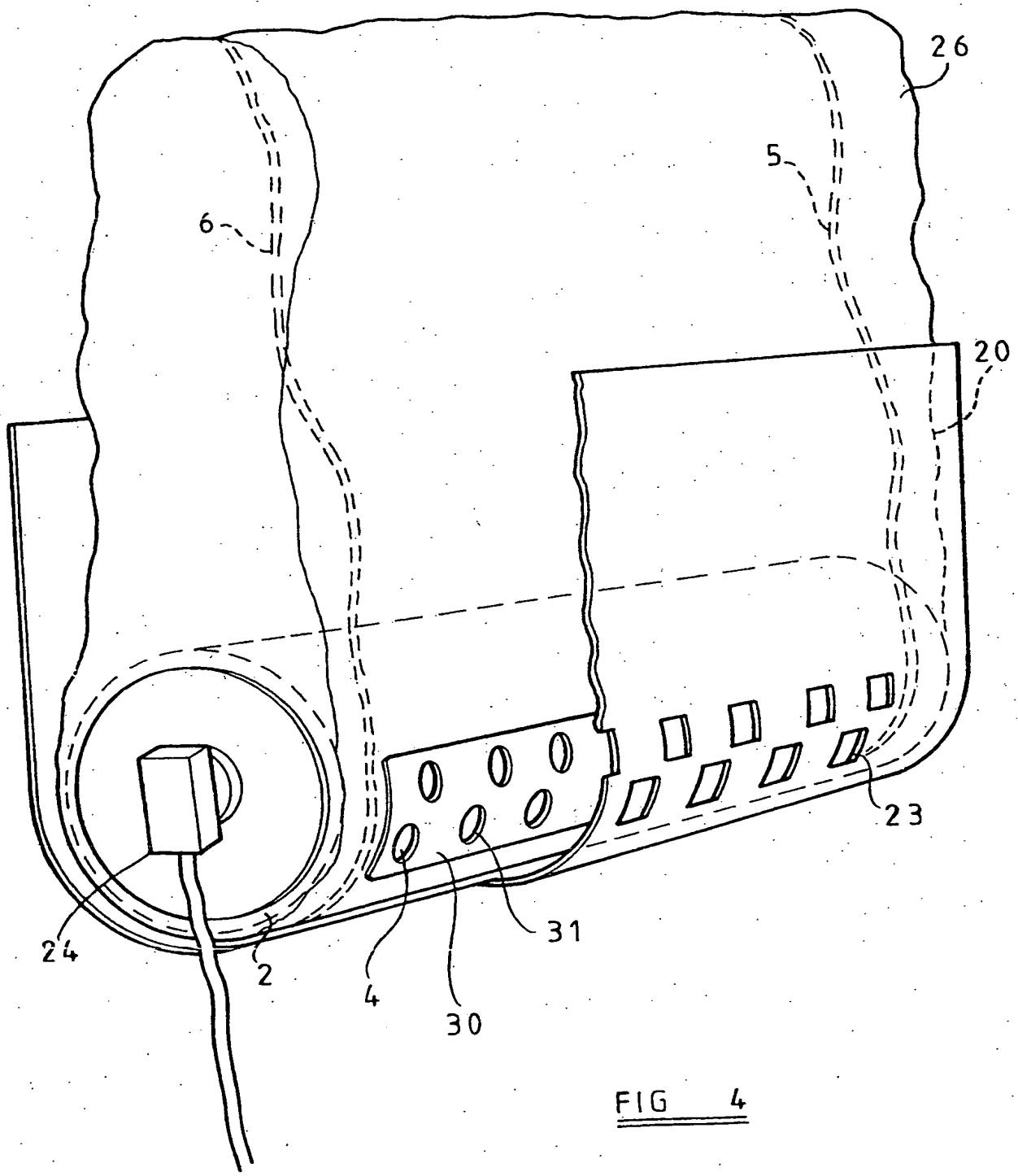

FIG 4

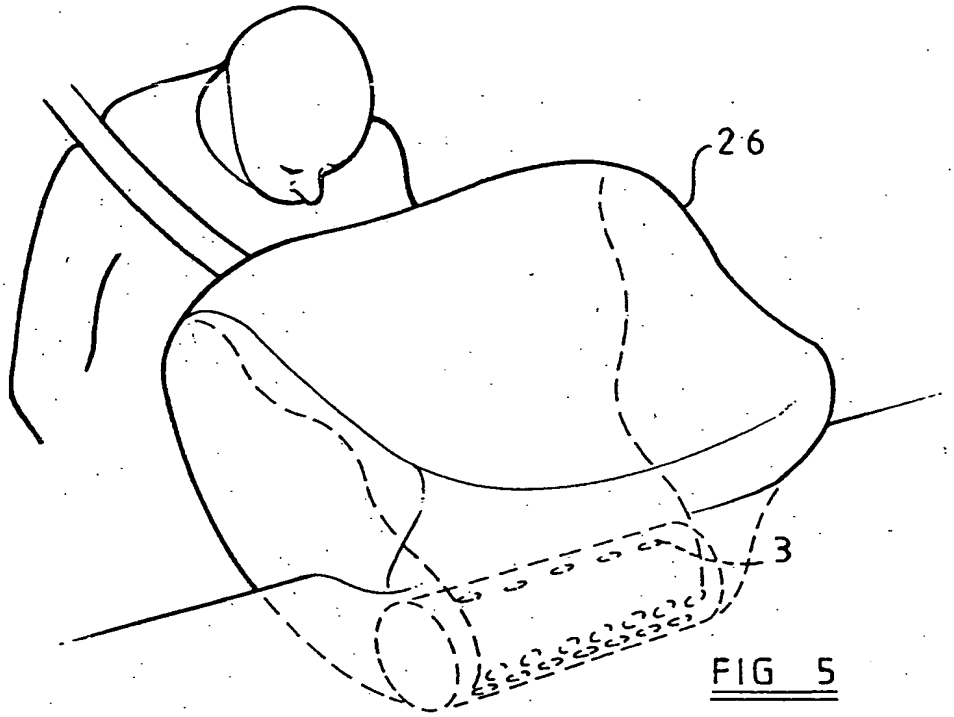

FIG 5

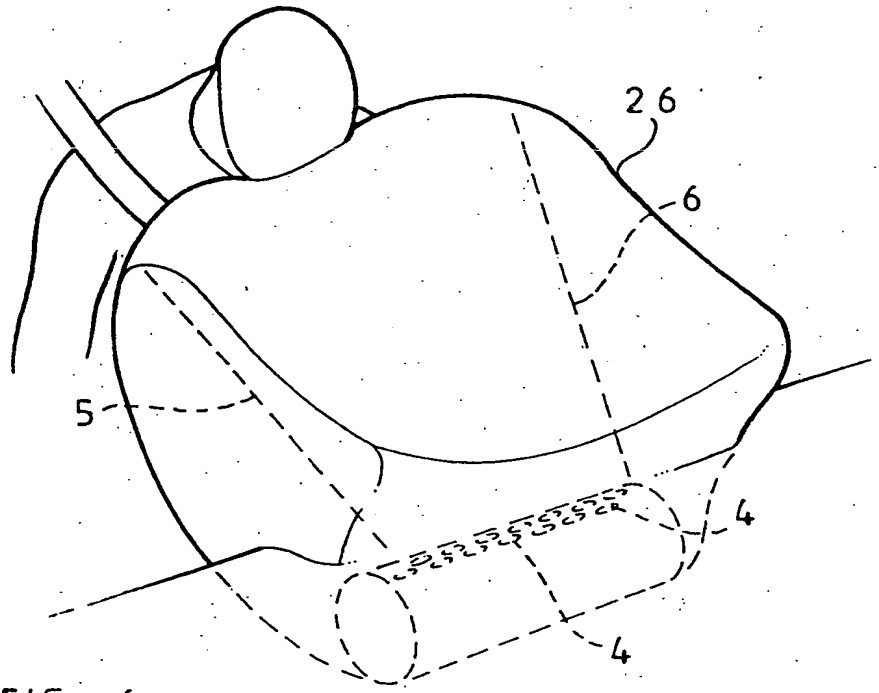

FIG 6

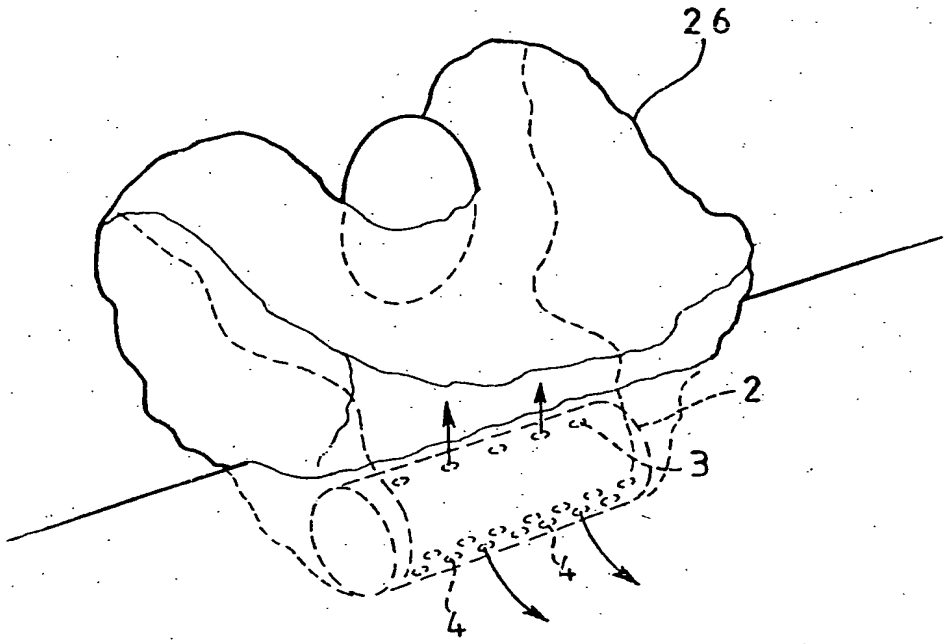

FIG 7

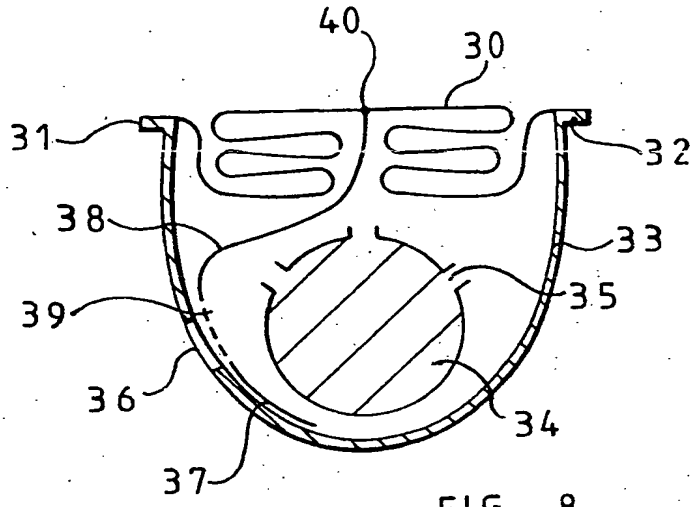
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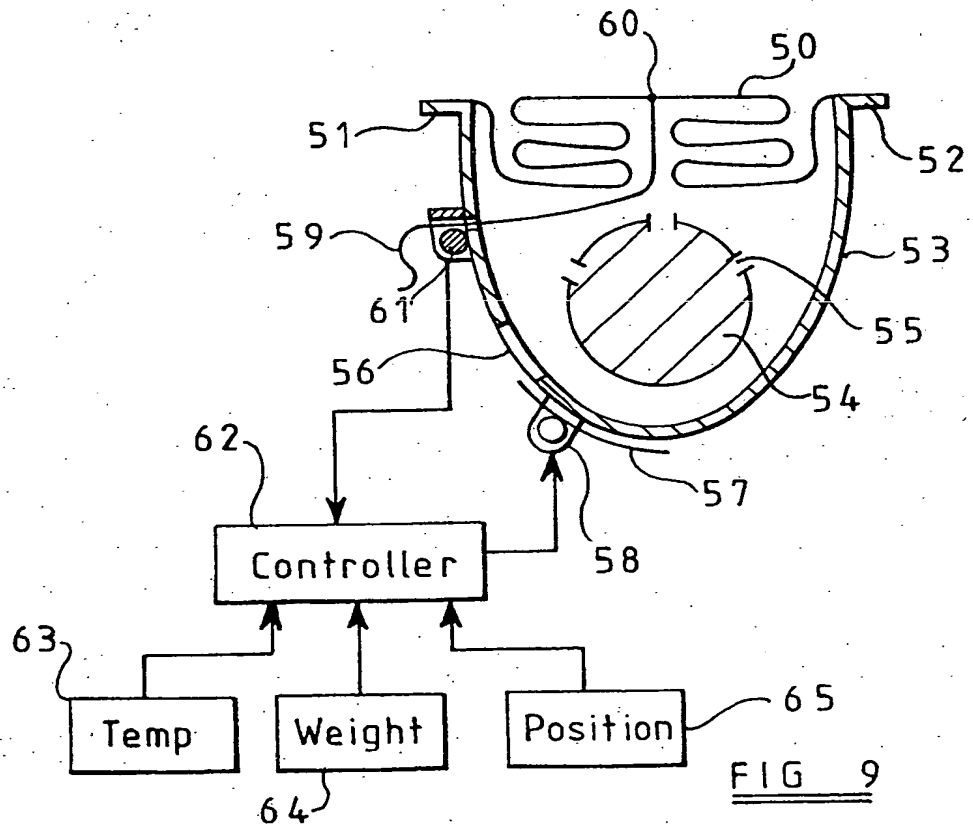
FIG 8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Controller
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Temp
Weight
Position
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FIG 9

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 99/00957

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B60R 21/28
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B60R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0599377 A1 (GENERAL MOTORS CORPORATION), 1 June 1994 (01.06.94), figure 5b, abstract --	1-15
Y	US 5707078 A (SWANBERG ET AL), 13 January 1998 (13.01.98), figure 2, abstract --	1-15
A	EP 0800967 A2 (ROBERT BOSCH GMBH), 15 October 1997 (15.10.97), column 6, line 20 - line 29, figure 1, abstract --	3-5,7,10, 12-15
A	GB 2306409 A (AUTOLIV DEVELOPMENT AB), 7 May 1997 (07.05.97) --	3,4,7,10,12, 13,15

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
8 Sept 1999	05 -10- 1999
Name and mailing address of the ISA Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Hans Nordström/CF Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 99/00957

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 5366242 A (FAIGLE ET AL), 22 November 1994 (22.11.94), figures 9,12, abstract ---	3,4,7,10, 12-15
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Information on patent family members

02/08/99

International application No.
PCT/SE 99/00957

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